AGRICULTURAL NEWS LETTER

VOL. 14 - NO. 4 JULY-AUGUST, 1946

This publication contains information regarding new developments of interest to agriculture based on laboratory and field investigations of the du Pont Company and its subsidiary companies. It also contains published reports and direct contributions of investigators of agricultural experiment stations and other institutions as related to the Company's products and other subjects of agricultural interest.

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DU PONT'S PART IN NATIONAL SECURITY PROGRAM PRINTED IN BOOKLET FORM

The scope of the war-production role of E. I. du Pont de Nemours and Company has been revealed in a special report to stockholders from W. S. Carpenter, Jr., president.* (Excerpts of special interest to agriculture are included on page 66 of this issue.)

During each of the last three war years, the company increased its production of chemical materials from its own plants to more than double 1939 levels, the report said. Included were nylon, plastics, rayon yarn, dyes, industrial chemicals of many types, finishes, insecticides, fertilizers, pigments, photographic film, and a variety of other chemical products.

In addition, Du Pont built for the Government 54 plants of various sizes at 32 different locations. Total cost of these facilities engineered, designed, and constructed for the Government by Du Pont's Engineering Department was $1,034,000,000.

Du Pont-operated, Government-owned plants produced military explosives, ammonia, methanol, neoprene synthetic rubber, and various chemical specialty materials with a total value of $895,000,000.

Company Undertook Many Specialized Assignments

The company was called upon, in addition, to undertake a large number of highly specialized assignments, including a part in the atomic energy operation, the organization and execution of an explosives program treble that of World War I, and assistance to Remington Arms Company, a subsidiary, in developing the greatest small arms ammunition output in history.

Earnings and Sales Prices Decline

Despite the large increase in volume, earnings per share of common stock during the war years declined 21 per cent below the 1939-1941 average and 5 per cent under the 1936-1938 level, the report showed. At the same time, the average of Du Pont sales prices declined approximately 5 per cent while the national average of wholesale prices increased 37 per cent.

Emphasizes Need to Insure World Peace

"World War II brought to the Du Pont Company the necessity of interrupting its regular activities and development to perform, like so many millions of individuals, a simple duty," wrote Mr. Carpenter.

*Copy of booklet containing full text of Mr. Carpenter's report will be sent on request. Address Editor, Du Pont "Agricultural News Letter", Wilmington 98, Delaware.

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"Now, the end of the war finds Du Pont, as it does the nation, eager to resume its normal constructive role. It should be plain that the business interests of the company lie, primarily and overwhelmingly, with peace. However essential to modern warfare the chemical industry may be, its prosperity and its prospects can be realized only in a peaceful, orderly society.

"Every practical consideration, therefore, in addition to the obvious personal and humanitarian aspects, prompts the prayer that means will be found to build and insure world peace forever."

Military Explosives 25 Per Cent of Production

Between December, 1940, and August, 1945, Du Pont produced approximately 4,500,000,000 pounds of military explosives -- three times its 1915-1918 output and 20 per cent above the entire volume used by all Allies during World War I. Military explosives, however, accounted for less than 25 per cent of the company's total production in World War II, compared to approximately 85 per cent in World War I.

Wide Range of Materials Produced for Military and Home-Front Use

Materials produced for military and home-front consumption "ranged from chemicals used in production of heavy armaments to such homely necessities as household cement," Mr. Carpenter said. Major items included:

537,700,000 pounds of rayon yarn and staple fiber;
80,000,000 pounds of nylon yarn and flake;
301,932,000 pounds of neoprene synthetic rubber;
7,700,000,000 pounds of sulfuric acid -- the company's largest single bulk product;
26,153,000 pounds of "Lucite" acrylic resin sheeting for transparent aircraft enclosures;
40,000,000 gallons of paints and other finishes for military needs.

Measured in dollar volume, more than 79 per cent of Du Pont's entire output during the war was produced with its own facilities and its own capital, Mr. Carpenter reported.

Du Pont's Part In Atomic Energy Project

The largest single Du Pont undertaking of the war, he said, was the company's part in the atomic energy project, in which Du Pont designed and constructed a small-scale pilot plant at the Clinton Engineer Works in Tennessee, and designed, built, and operated the $350,000,000 Hanford Engineer Works near Pasco, Wash., for the manufacture of plutonium.

"The company's entire compensation for its services in connection with each of the Clinton and Hanford projects was a fee of $1.00 and,

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at the company's own request, it was stipulated that no patent rights growing out of this work should accrue to Du Pont," Mr. Carpenter said.

War Commitments Handled With "Sustained Loyalty and Cooperation"

Du Pont engineered, designed, and constructed eight Government-owned explosives plants, the cost of which approximated $500,000,000, the report stated. In no instance was operation delayed because of failure to meet construction schedules; nearly all units were ready for initial production months ahead of contract requirements.

Commending "the sustained cooperation and loyalty" of the employees, which "contributed much to the handling of war commitments," Du Pont's president noted that no major labor difficulties occurred, and that the loss in man-hours due to work stoppage was less than 1/50 of 1 per cent.

Unprecedented Expansion of Facilities

The explosives program demanded unprecedented expansion, Mr. Carpenter declared. Included in the 4,500,000,000 pounds of military explosives produced were 2,500,000,000 pounds of smokeless powder, 1,500,000,000 pounds of TNT, 110,000,000 pounds of tetryl, and 200,000,000 pounds of RDX compositions.

"The company's own capacity for military explosives before the war was negligible," he said. "For 20 years, prior to 1940, such materials had accounted for less than 2 per cent of sales."

In August, 1939, the report showed, not more than 400 employees were directly engaged in making military explosives, all of which then was "going to the United States Government to fill the modest peacetime training requirements of that time." When military explosives production reached its peak in January, 1943, more than 37,000 workers were engaged. Six large ordnance plants had been built and put into operation, a seventh being added later.

Improved Production Rates Saved Many Millions of Dollars

Improved production rates saved at least $257,700,000 in construction costs, the report said. By increasing the yield per smokeless powder line from 100,000 pounds to 167,000 pounds per day, necessity for nine lines was eliminated, averting an additional outlay by the Government of $171,000,000 for construction alone. Similarly, TNT rates were raised from 33,000 to 100,000 pounds per line per day, and these improvements, made available to all TNT producers, saved an estimated $86,700,000 for construction.

Operating cost of the explosives plants declined steadily, Mr. Carpenter said. Cost of TNT declined 47.9 per cent, of rifle powder 35.5 per cent, of tetryl 56.7 per cent, over the war period. Fixed fees for explosives produced in Government-owned plants were reduced an average of 48.1 per cent as costs came down.

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Fees from Government Comparatively Small Part of Operating Income

"Fees from war plant operation and construction amounted to less than 2.7 per cent of the company's total net operating income" between December 31, 1939, and December 31, 1945, the report said. "For the entire period, the average annual compensation received for constructing and operating Government-owned war plants amounted to approximately 11 cents a share on the common stock, or slightly over 1½ per cent of the average net earnings per share of approximately $6.37 from January 1, 1940, to December 31, 1945."

Fees received from the U. S. Government for construction of Governmen-owned war plants, BEFORE TAXES OR ANY APPLICABLE CHARGES, amounted to 1-1/5 per cent of construction cost. Fees received from operating plants, again BEFORE TAXES OR CHARGES, amounted to 6 per cent of the cost of the product. Total compensation for building and operating Government-owned plants equalled 3-1/3 per cent, BEFORE TAXES OR CHARGES, of the combined construction and operating costs.

AFTER TAXES, applicable administrative costs, and out-of-pocket expenses for which the Government does not make reimbursement, it is estimated that net compensation for construction services approximate 1/15 of 1 per cent of construction costs and for operating services 4/5 of 1 per cent of product cost, the total being equivalent to slightly less than 2/5 of 1 per cent of the combined operating and construction costs. It was noted that the "after taxes" figure is the "only logical basis of return to the company."

Company's Safety Record Impressive

Outlining Du Pont's safety record, Mr. Carpenter reported that the accident "frequency rate" -- measured by the number of time-losing injuries per million man hours worked -- averged 1.44, compared with a general wartime average of approximately 10 for the entire U. S. chemical industry and 14 for U. S. industry as a whole. The explosives program's record of 1.41 showed less than one lost-time accident for each ten million pounds of military explosives produced.

Employment Hit Peak in 1942

Peak employment was reached in September, 1942, with a total of 136,300, made up of 60,800 in company locations and 75,500 at Government-owned plants and on construction work. Nearly 30 per cent of employees were women when the war ended.

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EXCERPTS OF SPECIAL INTEREST TO AGRICULTURE FROM REPORT TO STOCKHOLDERS ON DU PONT'S CONTRIBUTION TO THE NATIONAL SECURITY PROGRAM

The following extracts of particular interest to agriculture are quoted from the special report recently sent to stockholders on the Du Pont Company's contribution to the national security program:

Ammonia -- "Synthetic ammonia is a basic raw material of modern military explosives. The need for a vastly greater output than could be supplied by all 1939 facilities was foreseen early in that year and steps taken to augment du Pont's capacity at its Belle, W. Va., plant. A site was acquired at Morgantown, W. Va., and turned over to the Ordnance Department at cost, while a procurement program calling for long-term delivery of equipment was continued in the Government's behalf. These steps, undertaken at the Government's request, made it possible to save months in bringing the Morgantown plant into production. Operations began on the very day the Japs attacked at Pearl Harbor.

"The chemical industry created modern, low-cost facilities to produce, through fixation of nitrogen from the air, more than double the normal consumption of nitrogen-bearing compounds for fertilizers and all industrial uses. During World War I, it will be recalled, the nation was dependent on natural nitrates from Chile. With a domestic source of supply, cargo ships which would have been required to transport the natural product were released for other essential work."

"Freon" -- "The 'Freon' fluorinated refrigerants, with their unique and harmless properties, made it possible to create a new weapon to combat insects threatening the health of fighting men. One of these products, in particular 'Freon-12', produced by Kinetic Chemicals, Inc. over the past years for use in commercial and household refrigeration, proved to be an ideal propellant in the newly-developed aerosol insecticides, which were used so effectively against malaria-carrying mosquitoes and other germ-bearing pests."

Vitamin D for Poultry -- "Large quantities of synthetic vitamin D, representing du Pont research started in 1929, were supplied for the poultry industry."

Insecticides -- "Among the strategic materials necessary to success in war are insecticides. At the front they protected troops against the pest-borne diseases while saving tons of foodstuffs from destruction at home.

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"Adoption of DDT to the scale of a general insecticide was a development in which the Company shared. The existence of the chemical dichlorodiphenyltrichlorethane had been known for years, but its insecticidal properties were discovered only recently and production had never been geared to economical processes.

"Because of its effectiveness, large quantities became necessary to avert epidemics in liberated areas and in safeguarding the health of troops. At a new plant built on Company property at Grasselli, N. J., Du Pont produced 4,468 pounds during November, 1943, the first month of operation, and by V-J Day, 11,250,000 pounds had been produced entirely for military use.

"Cost and price of DDT have declined steadily. It was introduced at $1.60 a pound, although Company costs at the time were $1.703 a pound. Each pound represented additional research costs of 71.2 cents. By the end of the war, improved efficiency of operations had brought the price down to 46 cents a pound, a reduction of 70 per cent.

"Fungicides and insecticides of all types were produced in greatly expanded volume. Arsenicals were widely used for the protection of food crops against pests. Phenothiazine, another Company product, by protecting food animals from internal pests, was a factor in helping expand farm production of cattle, sheep, hogs and poultry."

<u>Sulfuric Acid</u> -- "Sulfuric acid was the Company's largest single bulk product made during the war. More than 7,700,000,000 pounds were supplied between Pearl Harbor and V-J Day. A basic material, vital in war or peace, sulfuric acid is essential to the manufacture of steel as well as to production of textiles, explosives, chemicals, <u>fertilizers</u>, gasoline, oils, and other indispensables. Ninety-one per cent of all the sulfuric acid produced by the Company went into direct or indirect war uses."

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ANTU IS EFFECTIVE NEW RODENTICIDE FOR NORWAY (BROWN) RATS

Practically all of the research to date with alpha-naphthyl thiourea (ANTU) as the active ingredient in rat poisons has been restricted to the laboratory and to city districts. However, results indicate that proprietary rodenticides containing Du Pont's Rodenticide-AN (ANTU), properly used, can be of great help in ridding farm properties of NORWAY or brown rat infestations. For that reason, and because of the tremendous damage and loss caused by these rats on farms, estimated at $200,000,000 annually, investigation of the efficacy and best methods of application of ANTU-containing rodenticides on farms is now underway.

The Du Pont Company wishes to make it clear that its ANTU product, Rodenticide-AN, is sold only to qualified rodenticide manufacturers, and not direct to the consumer by Du Pont.

"A new rat poison, alpha-naphthyl thiourea (abbreviated ANTU) has been discovered which compares very favorably with other rodenticides at present available as to cost, toxicity, and voluntary acceptance by rats."

So says Dr. Curt P. Richter of the Psychobiological Laboratory, Phipps Psychiatric Clinic, the Johns Hopkins Hospital, Baltimore, in "The Journal of the American Medical Association," Vol. 129, No. 14.

Dr. Richter points out that ANTU, now manufactured commercially by the Grasselli Chemicals Department of the Du Pont Company for sale only to manufacturers of proprietary rodenticides, is a relatively specific poison for Norway rats, being less toxic to other species tested.

The Johns Hopkins scientist points out that ANTU kills by its action on the capillaries of the lungs, producing pulmonary edema which causes death by virtual drowning. It cannot be emphasized too strongly that much is still to be learned about this matter of toxicity. While Dr. Richter's work indicated that ANTU could be considered an effective poison only for Norway rats, rodenticides containing this product should be considered sufficiently toxic to man and all forms of animal life to justify taking precautions to prevent accidental poisoning of children, pets, and all farm animals.

"No antidote is yet available, but the great insolubility of alpha-naphthyl thiourea makes prompt stomach lavage a useful countermeasure," Dr. Richter states. "Should pulmonary edema develop following accidental

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human poisoning, oxygen should be administered but no fluids should be given either by mouth or intravaneously."

How Interest In ANTU As Rodenticide Arose

Dr. Richter says that interest in ANTU arose directly from studies on the self-selection of diets, which showed that rats are capable of choosing nutritive substances and avoiding harmful ones. This ability to make beneficial dietary selections was found to be lost when taste nerves were completely severed. It was, therefore, concluded that some connection exists between the taste of substances and their nutritional or toxic values.

"To test this theory, the toxicity of various bitter substances was determined," he says. "One very bitter substance which was considered non-toxic was phenyl thiourea, also known as phenyl thiocarbamide. Since the observation of Fox in 1931 that, while this compound tasted very bitter to most people there were some who could not taste it at all, phenyl thiourea has been widely used for research in the fields of genetics and sensory perception."

Dr. Richter says that following the usual method of testing taste ability in human beings with phenyl thiourea, he and his associates placed a few crystals on the tongues of six rats. To their surprise, all six were found dead the next morning.

Wartime Shortages of Staple Rat Poisons Accelerate Research

"Shortly before the entry of this country into the war it was realized that we were in a very vulnerable position with respect to the control of rats and rat-borne epidemics," he explains. "Red squill, the staple rat poison, was no longer available in adequate amounts because the Axis powers held the sources of supply along the Mediterranean seaboard. Other possible poisons were eliminated by critical requirements or potential hazards in use.

"The wide and prolonged use of phenyl thiourea for taste and inheritance tests without any accidents indicated that it probably does not have any toxic action on man. This probability, coupled with its high toxicity to rats, make it seem an excellent candidate as a substitute for red squill. Through the interest of Colonel Perrin Long, at that time chairman of the Committee on Chemotherapeutic and Other Agents of the Division of Medical Sciences of the National Research Council, a grant was given this laboratory to test phenyl thiourea as a rat poison and also to determine which baits would serve most effectively in its use. The work was begun January, 1942."

Du Pont Supplies Over 200 Compounds for Evaluation

In his paper, Dr. Richter outlines the successive steps in the

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investigations which subsequently resulted in a search for a thiourea derivative that would have the same high toxicity as phenyl thiourea without its bitter taste.

"A request to the E. I. du Pont de Nemours Company for thioureas and related compounds which might possess the desired characteristics brought a prompt and helpful response," he says. First and last, over 200 samples were sent to Dr. Richter.

These were evaluated and nine compounds were found to possess toxic values comparable to phenyl thiourea. The most promising appeared to be ANTU, which gave a good kill when used as a field rodenticide.

"The thoroughness of distribution, the use of several alternate baits, and the preliminary clean-up were all considered to have contributed materially to the success of the campaign," Dr. Richter states. Subsequent tests verified the preliminary results, and further research is now being conducted throughout the country.

In his discussion, Dr. Richter states there is doubtless still much to be learned on the effective use of ANTU as a rodenticide, but "procedures have been developed by which in an emergency the rat population of a city could be brought under control in a very short time."

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NEWLY PURCHASED CATTLE SHOULD BE ISOLATED FROM HOME HERD FOR CAREFUL OBSERVATION AND TREATMENT OF WOUNDS TO PREVENT SCREWWORM INFESTATION

Intermingling of home-grown cattle and animals newly bought from stockyards or from other states is frowned upon by Dr. I. S. McAdory, Alabama state veterinarian.

"Animals to be added to local herds should not be allowed to mingle with home stock until they have been proved free of screwworms," Dr. McAdory advises. "All carcasses of animals that die should be burned. Animals having wounds should be isolated in a small lot or pasture where they can be watched and receive necessary treatment."

The Alabama veterinarian recommends daily inspection of herds, and treatment of animals with wounds. He says operations such as dehorning, castration, shearing, and docking should be done in cool weather, if possible.

"An excellent treatment, recently developed by the U. S. Department of Agriculture, is Formula or Smear 62, containing benzol, the best material for killing the worms in wounds, and diphenylamine, a powdered chemical good for protection against infestation," Dr. McAdory says.

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THE SLURRY METHOD FOR TREATING SEED CORN

By G. F. Miles

A broad approach to the problem of improving the present commercial seed-treatment practices should involve much more than the development of better seed disinfectants. Coordinated with the search for more effective chemicals should be the critical examination and constructive criticism of the equipment and methods used for applying the disinfectants.

Although much progress has been made during the past 25 years in perfecting seed-treatment practices, there is still plenty of room for improvement in both the chemical and mechanical aspects of the problem. A list of the more obvious improvements needed would include such advances as: speeding up the rate at which seed can be treated, elimination of flying dust by ventilation or other measures, better distribution of the chemical over the surfaces of the seed, and greater accuracy in applying the correct dosage of chemical to the seed. Seed processors, aided by the manufacturers of seed-treating chemicals and equipment, are making substantial progress in overcoming some of these obstacles to economical, safe, and efficient seed-treatment operations.

While the Semesan Division of the Du Pont Company has as its primary objective the discovery, development, and commercial introduction of better seed disinfectants, it operates under a broad policy which does not limit its research to the field of chemical fungicides, but which permits and encourages any technical contribution that furthers the practice of seed treatment.

New Type of Treater and New Chemical Formulation Required

An example of the fruits of this policy is to be found in the recent development of an entirely new and superior method of treating seed corn, which required the designing and construction of a new type of seed treater as well as the development of a new chemical seed-treatment formulation. The new method - called for convenience the slurry method - involves the application of the chemical disinfectant to the seed in the form of an aqueous suspension or slurry instead of as a dust or powder.

The slurry or aqueous suspension of the seed-treating compound is prepared by adding a specially formulated powder, known as "Arasan" SF fungicide, to water at the rate of 1 pound of powder to 1 gallon of water. The powder wets out quickly, and is easily held in suspension with a little agitation. The resulting slurry is a faintly pink suspension with a consistency approximating that of buttermilk. Each gallon of the slurry is sufficient to treat about 32 bushels of seed corn.

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Active Ingredient of "Arasan" SF Is Tetramethyl Thiuram Disulfide

The active ingredient of "Arasan" SF is 75% tetramethyl thiuram disulfide. Seed-corn growers and processors will recognize this as the same chemical which has already demonstrated its effectiveness as a seed-corn disinfectant and protectant under the trade-mark "Arasan".

The proposal to add a water suspension to seed that has just been dried down to a moisture content of 14% at a very considerable expense may seem rather incongruous. It should be explained, therefore, that the amount of water added to the seed by the slurry method is never more than about one-half per cent of the weight of the seed. Moreover, it is probable that most of this water, which is equivalent to about one-fourth pint per bushel of seed, quickly evaporates and is not absorbed by the seed.

The development of the slurry method of treating seed corn necessitated the designing and construction of an original device or mechanism for applying the slurry to the seed corn. This device, usually referred to as a slurry treater, synchronizes the flow of the seed and the slurry so that every bushel of seed receives the same accurate dosage of chemical. No calibration or adjustment of the slurry feed is required. In fact, it is not even possible through accident or carelessness to apply either more or less than the correct amount of slurry.

The only adjustment that can be made by the operator regulates the rate at which the seed is treated. The action of the slurry treater can be slowed down so as to treat less than 100 bushels of seed per hour, or it can be speeded up at the will of the operator to handle up to about 300 bushels per hour. Regardless of the rate at which the seed is treated, however, the amount of slurry applied is almost exactly the same for every bushel of seed passing through the machine.

Two Outstanding Advantages of Slurry Method

The slurry method possesses two outstanding advantages over present procedures in treating seed corn. First, it will completely eliminate flying dust during seed-treating operations. Ventilation or dust exhaustion will not be needed, and it will not be necessary for workmen to wear masks. It is not yet surely known whether this complete freedom from flying dust will obtain also while the sacks are being handled during the shipping season. Preliminary trials with non-lined sacks showed no more dust escaping during the handling of sacks of slurry-treated seed than from sacks of untreated seed. At any rate, it can be said that the slurry method will almost, if not completely, eliminate flying dust in the warehouse during the shipping season.

The second important advantage of the slurry method over the use of dust disinfectants in the treatment of seed corn relates to the accuracy and the uniformity of the dosage of chemical applied. In many seed-corn

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treating plants insufficient attention is given to the correct calibration of the powder-dispensing device on the seed-treating machines. As a consequence, some of the seed is heavily over-dosed and some is given an inadequate dosage.

One of the objectives in designing the slurry treater has been to eliminate the possibility of applying either excessive or insufficient dosages of chemical. The only responsibility in this respect left to the operator is to prepare the slurry at the proper concentration. The powder should be weighed (not measured), and the water should be measured accurately - 1 pound of "Arasan" SF powder to each gallon of water.

Principal Operating Features of Slurry Treater

It is not possible here to explain in detail the construction and operation of the slurry treater, but it may be of interest to point out the principal operating features of the device. Flowing into the hopper of the treater from an overhead bin, the corn is metered by a tilting seed pocket. When ten pounds of corn have flowed into the pocket, the latter tilts and dumps its load into the treating chamber. A counter-weight returns the pocket to its original loading position, and holds it there until another ten pounds of corn have poured into the pocket.

By means of a shaft fixed to the back edge of the pocket, the two movements - downward to unload and upward to reload - of the tilting grain pocket are transmitted to an endless sprocket chain equipped with small slurry buckets. The chain runs over two sprocket wheels, one of which with 15 teeth is idle on the shaft and the other with 9 teeth being located on a short shaft on the bottom of the 17-gallon tank containing the slurry. Each time the grain pocket dumps a load of seed corn, the shaft turns the 15-tooth sprocket by means of a ratchet wheel through an arc of three teeth. Since every third link on the sprocket chain carries a slurry bucket, each dumping movement of the grain pocket advances one slurry bucket and dumps its slurry contents into the mixing chamber with the seed corn. Each slurry bucket holds just enough slurry to treat the 10 pounds of corn metered by the tilting grain pocket.

Treated Seed Can Be Sacked and Stored Immediately

Distribution of the slurry over the surfaces of the seed in the treating chamber is effected in the same manner as seed corn is now coated with dust disinfectants in some treaters, namely, by means of rapidly revolving agitator blades. As the seed leaves the slurry treater it is not noticeably moist, and no drying period is required. It can be sacked directly from the slurry treater, and stored under any conditions of temperature and humidity suitable for untreated seed.

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Numerous Tests Show Slurry Method Gives Excellent Results

Laboratory, greenhouse, and field tests with many seed-corn hybrids and open-pollinated varieties of seed show that the slurry method at least closely approximates the effectiveness of the "Arasan" dust method even under severe conditions. The spring of 1945 with its prolonged cold wet spell of weather provided an excellent opportunity to compare the effectiveness of the slurry and "Arasan" dust methods under extremely adverse soil conditions. In one field test with 16 lots of hybrid seed corn, the soil temperature hovered around 50° F., for nearly three weeks after planting time, and water stood in the planted rows for days at a time. The average stand for the untreated seed lots, some of which were deliberately selected for testing because of low quality, was 61.6 per cent. The corresponding average stand for the slurry-treated seed was 79.3 per cent, and for the "Arasan" dust method 80.0 per cent. The yields were 40.9 bushels per acre for the untreated seed, 50.7 bushels for the slurry, and 51.6 bushels for the "Arasan" dust.

In a field test conducted in Iowa under very unfavorable soil conditions with respect to temperature and moisture the average per cent increase in stand over untreated seed for 24 lots of hybrids of various grades was 79.4 for the slurry method and 67.2 for the "Arasan" dust.

Again under the severe conditions of 1945 in Illinois, 12 lots of hybrids showed an average per cent increase in stand over untreated seed of 305.7 for the slurry and 279.0 for the "Arasan" dust.

It can be seen from the results of these experiments that the slurry method even under these severe conditions has given a good account of itself in comparison with "Arasan" dust. It may require much field experimental work to determine whether there is any significant difference in the efficacies of the new slurry method and the older dust method.

"Arasan" SF Available In Late Summer -- Slurry Treaters Being Manufactured

"Arasan" SF will be available commercially in the late summer of this year. Some manufacturers of seed treaters have begun or will begin shortly production of the new slurry treater. A number of hybrid seed-corn producers have already expressed their intention to treat all or a part of their seed by the slurry method during the coming season.

From our present knowledge of the slurry method, it seems probable that it will help substantially to improve the practice of seed-corn treatment under seed-treating-plant conditions. Unquestionably, our further experience with the slurry treater and method will lead to improvements. It is believed, however, that the present device and method are basically sound.

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HOW TO DETECT PEACH BORER INFESTATIONS

Masses of gum mixed with sawdust-like refuse at or near the bases of the trees reveal the presence of peach borer infestations. The injury itself may extend above the ground line for 10 or 12 inches and below the ground line along the main roots for as much as 8 inches.

The borer, one of the most destructive of all the insects that attack peach trees, occasionally becomes a serious pest to plum and cherry trees. The caterpillar is a yellowish-white or cream color with a dark-brown head, and when full grown is about 1½ inches long.

The adult moth deposits large numbers of eggs on the trunks of the trees or on trash or in crevices in the ground near the trees. The young borers that hatch from these eggs tunnel through the bark into the growing tissues of the trees.

Many peach trees, killed each year, might be saved by controlling the borer with paradichlorobenzene. Trees of all ages, from nursery stock to those ten or more years old, are attacked. Many young trees, sometimes attacked within a year after planting, are girdled and killed. Older trees are often injured so severely that their vitality is reduced. This, in turn, prevents production of a satisfactory crop, and renders the trees more susceptible to the attacks of other insects, such as pinhole borers and fruit-tree bark beetles.

PARADICHLOROBENZENE GIVES BEST CONTROL OF PEACH BORER WHEN USED IN FALL

Paradichlorobenzene, the same vaporizing, fume-producing chemical used in recent years for control of clothes moths, gives best control of peach borer infestations if applied in the fall when the soil is neither too warm nor too cool. If the temperature is too high, the chemical volatilizes too rapidly and may injure the tree and be less effective because it dissipates too rapidly. If it is too low, volatilization or vaporization will be too slow, and the amount of the gas formed too little to be effective. The chemical is ineffective when the temperature drops much below 60 degrees F. Local authorities should be consulted as to the best time for making fall applications in any given locality.

Then, too, in the fall, after most of the moths have laid their eggs, the borers are small and more or less exposed because they have not tunnelled

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deeply into the tissues. They are not only more susceptible to the fumes of the chemical, but also more easily reached by the gas.

Best dates of application therefore usually range from August 15 in Michigan, New York, and New England, to as late as October 25 in Southern Illinois.

Vaporizes at Ordinary Temperatures -- Fumes Kill Pests

"Parapont", Du Pont's name for its paradichlorobenzene product, is a pure, unadulterated, white crystalline chemical, uniform in particle size. It vaporizes slowly at ordinary temperatures, forming a gas that is appreciably heavier than air. This gas is poisonous to many insects if they are exposed to the fumes in the proper concentration for a sufficient length of time.

When paradichlorobenzene is applied to peach trees at the proper time and in the proper way, the packed earth prevents the rapid escape of the gas, which, being heavier than air, reaches the borer larvae or caterpillars inside the trunks of the trees, usually at or near the ground line. Mounds should be removed after four weeks.

Since the fumes are confined, the gas acts over a considerable period of time, depending largely upon the actual soil temperatures.

Paradichlorobenzene Can Be Applied In Spring

If fall application is neglected or ineffective because of improper timing, spring treatment should be made. A spring application of "Parapont" will kill the borers, although the damage at this time from larger borers is much greater than in the fall. Spring applications should be made as soon as the ground becomes warm -- at least 60 degrees F. The exact time varies with the locality. Since the correct time for best treatment in the spring varies from locality to locality, just as it does in the fall, the advice of local agricultural authorities should be obtained.

U. S. Department of Agriculture Pioneered In Research

It was not until the experiments of the Bureau of Entomology of the U. S. Department of Agriculture in 1915 showed the value and proper use of paradichlorobenzene that satisfactory and practical control of the peach borer was obtained. And, in pointing out that great care must be used in treating trees less than three years old, Du Pont entomologists emphasize: "When in doubt, consult your federal or experiment station entomologist or other local agricultural authority."

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U.S.D.A. WORKERS REPORT ON EFFECT OF FERRIC DIMETHYL DITHIOCARBAMATE ("FERMATE") ON EMERGENCE OF TOBACCO FLEA BEETLES FROM PLANT-BED SOIL

"Attention has been called to the possible insecticidal value of derivatives of dithiocarbamic acid. Ferric dimethyl dithiocarbamate has been demonstrated to be an effective fungicide for blue mold, Peronospora tabacina Adam. by Anderson and others. Guy found this material to be highly effective for inhibiting the feeding of Mexican bean beetles, Epilachna varivestis Muls., and Japanese beetles, Popillia japonica Newm. This was later confirmed by Tisdale and Flenner. It is the purpose of this note* to report the effect of this material on tobacco flea-beetle populations in tobacco plant beds."--Gilmer, Levin, and Smith, United States Department of Agriculture.

*Abstracted below.

Recent experiments show that ferric dimethyl dithiocarbamate, the active ingredient in "Fermate" fungicide, is a promising chemical for use in the seed bed in combination with a more toxic insecticide such as calcium arsenate for dual control of blue mold and flea beetles that attack tobacco plants.

U. S. Department of Agriculture research workers have previously determined that the tobacco flea beetles, known to science as Epitrix hirtipennis Melsh., that attack recently transplanted tobacco are probably reared in the plant beds. They found that enough first-brood beetles emerged from the soil on 100 square yards of open plant bed from May to July, inclusive, to sypply a population of 71 beetles per plant on an acre of tobacco.

"Since beetles of this brood usually begin migrating to the field one to three weeks after the tobacco is transplanted, and thus injure the plants at one of the most sensitive stages of growth, methods of reducing the initial populations of the flea beetles are of much interest," according to J. U. Gilmore and Clemence Levin, of the U. S. Bureau of Entomology and Plant Quarantine, and T. E. Smith, U. S. Bureau of Plant Industry, Soils and Agricultural Engineering. Reporting in the "Journal of Economic Entomology," Vol. 38, No. 5, they state:

"The experimental work was conducted at Oxford, N. C., during 1943 and 1944 on replicated plots of approximately 5 square yards in tobacco plant beds to develop a combination spray for the control of blue mold

Continued on next page

and flea beetles. There were four replicates in 1943 and three in 1944 in randomized blocks. Semi-weekly applications were made by means of a small-type power sprayer at a pressure of 125 to 150 pounds per square inch, as commonly recommended for the control of blue mold. All plots were uniformly inoculated with a viable suspension of conidiospores of the blue mold fungus to assure uniform distribution of inoculum. One plot was sprayed with ferric dimethyl dithiocarbamate at the rate of 2 pounds per 100 gallons of water. For another plot calcium arsenate at the rate of 4 pounds per 100 gallons was added to the ferric dimethyl dithiocarbamate spray. A third plot was untreated. In the latter part of May, prior to maturity of the beetle, three cloth cages, each covering 1 square foot of soil surface, were placed in the plots. On alternate days records were made of flea-beetle emergence into these cages, and the beetles were removed during each examination." Results are shown in the following table.

Emergence of Tobacco Flea Beetles from Soil of A Tobacco Plant Bed Sprayed with Ferric Dimethyl Dithiocarbamate Alone and In Combination with Calcium Arsenate.

Treatment	Beetles Emerging From 1 Square Foot of Soil		Reduction Due to Treatment	
	1943	1944	1943	1944
	Number	Number	Per Cent	Per Cent
Check (untreated)	73	106	0	0
Ferric dimethyl dithiocarbamate	39	19	47	82
Ferric dimethyl dithiocarbamate plus calcium arsenate	12	5	84	96

"The data on flea beetle emergence (See table) are in agreement for both years, although the reduction was greater in 1944 than in 1943. Ferric dimethyl dithiocarbamate alone significantly reduced the infestation, but when calcium arsenate was added greater results were obtained. Both spray mixtures gave highly effective control of blue mold. In transplanting trials, measurement data showed that, although the seedlings sprayed with the ferric dimethyl dithiocarbamate-calcium arsenate mixture at first tended to grow more slowly than those sprayed with the fungicide alone, there were no significant differences in growth 2 months after transplanting.

"The appreciable reductions in flea beetle populations in plant beds by ferric dimethyl dithiocarbamate suggest that this is a promising material for use in combination with a more toxic insecticide for dual control of the flea beetle and blue mold."

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APICULTURIST SAYS DDT MAY PROVE BOON TO BEEKEEPING

An acre application of 30 pounds of dust containing 5 per cent of DDT has been found to be as effective in the control of many insects as 30 pounds of dust containing 70 per cent of calcium arsenate, according to Dr. J. E. Eckert, University of California apiculturist.

"The 1.5 pounds of DDT thus applied per acre has caused no appreciable damage to bees, whereas calcium arsenate dust has been responsible for killing of thousands of colonies of bees in California and other states," he says.

Thus, Dr. Eckert points out, DDT may actually prove a boon to beekeeping "if it continues to be used in minimum quantities."

The California bee specialist explains that "while DDT is definitely toxic to honey bees and other pollinating insects, the proper timing of applications to keep the chemical off blossoms of those crops that are benefited by pollinating insects will further reduce the hazards now caused by other insecticides."

According to Dr. M. H. Haydak, in charge of bee culture at the Minnesota Experiment Station, a colony of bees per acre is adequate for most crops.

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PAINTED VS. UNPAINTED GRAIN BINS

Steel grain bins painted white reflect the sun's heat and are cooler than unpainted bins, an important factor in the fight against weevils.

That is the finding to date in tests conducted by the U. S. Department of Agriculture. According to William V. Hukill, agricultural engineer, of the Farm Buildings Section, the temperature of the wheat in white-painted bins was from 5 to 10 degrees lower than in unpainted bins of equal size.

"Similar results could be expected from the application of white paint to the steel roofs and sidings on barns and other farm buildings," Mr. Hukill states. "By reflecting the sun's heat, such buildings would be cooler in summer. The coating of galvanizing put on steel during the war was very light, and it might be advantageous to paint war-produced steel; also old galvanized surfaces which have been exposed to the weather long enough to remove the oil coating normally present on fresh galvanized surfaces."

Mr. Hukill says a metallic zinc paint for the priming coat will work much better than a flat paint.

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Vol. 14, No. 4 July-August, 1946

BLASTING DRAINAGE DITCHES REQUIRES LITTLE LABOR, NO EXPENSIVE EQUIPMENT

"Blasting drainage ditches is a particularly good method to open them since it requires little labor and no expensive equipment," according to Arthur S. King, Oregon State College soils specialist.

Professor King, writing in the April, 1946, issue of "Your Farm," says, "The main requirement is that the soil be completely saturated, and the wetter the better." He continues:

"Ditches can be constructed through swamps, marshes, or bogs where it would be impossible to use either hand labor or any type of mechanical equipment. The cost of construction is reasonable, averaging 7 cents to 10 cents for each lineal foot of ditch measuring approximately 3 feet deep and 8 feet wide."

Professor King says that for best results "special dynamite" is used, adding that "technically this grade of powder is known as a 50 per cent straight nitroglycerin dynamite put up in special 1¼-inch sticks. With this type of dynamite it is possible to use the propagation method of firing.

"With this method it is possible to shoot up to 1,000 feet or more of ditch at one time, using only one detonator or cap. The ditching dynamite is sensitive enough so that the shock of one charge is carried through the wet dirt throughout the entire length of ditch that is loaded. Charges are placed from 12 to 24 inches apart, depending upon soil conditions."

The Oregon soils specialist says the propagation method has several advantages. He explains: "Little hand labor is required; the charges are placed near the surface, rarely below 16 inches in depth; there is no spoil bank to worry about as the dirt removed from the ditch is scattered over an area 250 feet wide on each side; and so little time is required that an entire ditch can be constructed while one is merely thinking about other methods.

"Incidentally, there is no possibility with this method of postponing drainage indefinitely on the theory that when the soil is wet it is impossible to construct a ditch, while during the dry season there is no need for one."

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